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Based upon a multiple discriminant analysis of individual entrance examination data and upon a classification analysis of self-predictions, this study was an attempt to classify or predict major field of study at graduation for a sample of university students. University of Utah graduates of 1962 through 1966, in selected fields of study, served as the population. The study required two samples, and experimental sample upon which the discriminant functions were computed, and a cross-validation sample upon which the predictions as to major field of study were made. The results showed great variability as to the predictions which were obtained by the different systems of data among the various fields of study. It was concluded that there were characteristics measurable at the time students enter the university as freshmen which distinguish, as groups, students who eventually graduated in specific major fields of study. (Author)

# PREDICTING MAJOR FIELD OF STUDY: FRESHMAN SELF-PREDICTIONS OR PSYCHOMETRIC PREDICTIONS?[1]

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How well do freshman entrance data predict major field of study at graduation from a university? Are student's self-predictions as to field of study of predictive value? What kind of tests predict major field most effectively? Questions such as these have not been satisfactorily answered by counselors or researchers despite the fact that various types of entrance data have been collected in most university settings for many years. Generally when questions regarding choice of major field were concerned, counselors have turned to data from an interest inventory to make predictions regarding the student's field of study, but as Holland and Lutz (1968) have recently pointed out, this may not be the most efficient predictive data that we can use.

The purpose of this study was to compare the predictive validity of three types of freshman entrance data as predictors of major field of study at graduation for a sample of university students. The three types of freshman entrance data studied were (1) academic achievement test scores (Cooperative Achievement English, math, natural science, tests), (2) occupational interest inventory scores

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(Occupational Interest Inventory, sometimes called the "Lee-Thorpe OII"), and (3) self-predictive information from each student's freshman admission questionnaire.

## METHOD

University of Utah bachelor degree graduates of 1962 through 1966, in selected fields of study served as the population from which the samples were drawn for the study. The design required two samples for each field of study, a criterion (experimental) sample upon which the predictions were derived, and a cross-validation sample for which the predictions as to major field of study were made. After selection of the total sample in each field, the criterion and cross-validation samples were randomly determined with the aid of a standard table of random numbers.

Analyses were done separately for males and females. For each of the sexes the three systems of data were studied separately, yielding six major analyses. Multiple discriminant analysis was used as the classification procedure with the interest and achievement data. "Multiple discriminant analysis is a statistical method of combining test scores or other data so as to maximize the differences between the groups and minimize the differences within each group (Dunn, 1959, p. 15)." This classification technique has been used effectively in predicting academic group membership (Christensen, 1953; Stahmann & Wallen, 1966), and in the guidance of students based upon such predictions (Stinson, 1958). In predicting major field of study, Dunn (1959) found discriminant analysis to be superior to regression analysis and Tatsuoka (1957) found it to be superior to multiple regression analysis and a "joint probability model," which was a hybrid

of the discriminant and regression analyses. The criterion samples of the interest data and the achievement data were submitted to multiple discriminant analysis for the purpose of deriving weights which were then used as the basis for the prediction of major field for the cross-validation samples.

Self-predictive data were student responses to two questions on the freshman admissions questionnaire as follows: (1) "In what division do you expect to register? (Arts, Business, Education, Engineering, etc)." (2) "In what subjects do you plan to major? (First choice)." The responses to these questions were tallied for the total sample (excluding undecided and no response students) in each major field of study yielding seld-predictive information.

## RESULTS

The percentage of correct predictions (hits) based upon interest inventory data varied from 11.7% hits for pharmacy to 59.1% hits for business for the men. See Table 1. These predictions, with the exception of the pharmacy, greatly exceeded the number expected by chance. Using the achievement test data as the basis of prediction, the percent of hits ranged from zero for pharmacy to 62.0% hits for engineering. Frequencies arising from predictions for the pharmacy and secondary education fields approximated chance expectation while predictions for engineering, business and letters and science exceeded chance expectation. Achievement test data were more efficient predictors than interest test data for the male letters and science major field while the converse was true for the business and secondary education fields. Little difference in predictive efficiency between

the achievement test and interest inventory data was found for the pharmacy field in which both predictions were poor, and the engineering field in which both predictions were relatively good.

Correct predictions by the men in response to the question "In what division do you expect to register? (Arts, Business, Education, Engineering, etc)" ranged from 19.7% hits for letters and science to 92.8% hits for engineering. The responses to the question "In what subjects do you plan to major? (fisrt choice)," yielded hits ranging from 30.0% correct for secondary education to 86.7% correct for engineering. Here, seemingly similar questions resulted in different predictive efficiency for the same groups of students (viz: letters & science and secondary education).

Predictions for the women were more efficient than for the men. See Table 2.

## DISCUSSION

Several considerations should be made in interpreting the results of this study. First, even though the predictions span a meaningful time period, from entrance to graduation from a university, the predictions are for selected major fields of study in one university. Second, the predictions were based upon a classification system which was simply the colleges of study with the university. The data showed that this basis of classification was not one which all freshman students understood and consequently the reliability of self-predictions was affected. For example, some students who planned to teach history in a secondary school after graduation selected letters and science as their intended division of registration or first choice of major field, perhaps not knowing that the correct response, based on the classification system, was secondary education. Thus, a classification system as used by Holland & Lutz

(1968) would likely increase the predictive efficiency of expressed choice.

That valuable predictive information is contained in the three types of data studied is, at least partially supported by these findings. In summarizing the correct predictions across fields of study for the three types of data we found that first choice of major field and and intended division of registration emerged as the most efficient predictor of major field for the women. See Table 3. The interest inventory was the second most efficient predictor followed by the academic achievement data system. These findings, for the women, tend to support Holland & Lutz (1968) who found that expressed choice was superior to the Vocational Preference Inventory (VPI) in predicting vocational choice during the sophomore year from data gathered during the freshman year. A primary difference in these studies is the time differential, Holland & Lutzs' (1968) predictions being freshman to sophomore years and the present study being from freshman to graduation.

Predictions for the men by all types of data were less efficient than for the women. See Table 3. Expressed choice of field did not emerge as the single most efficient predictor as it did for the women. In ranking the predictors for the men, intended division of registration emerged as (1) followed by first choice of major field (2.5) and interest inventory data (2.5), with academic achievement data ranking (4). These findings did not support Holland & Lutz (1968) who found expressed choice to be the most effective predictor for the men, followed by the VPI.

What the current study suggests is that predictions made by freshman regarding field of study are at least as efficient, and in many cases more efficient, than psychometric predictions based upon interest inventory data or achievement test data when the criterion is

major field of study at graduation. In practice, the counselor might well put credence in student self-prediction rather than routinely turning to interest inventories for such predictions.

However, the results reported here are only suggestive and further research is needed. Further research on the topic of self-predictive vs. psychometric predictions might follow several lines of inquiry as suggested by the results of this investigation and that by Holland & Lutz (1968). One of these would be to study the predictive efficiency of other interest inventories. Similarily, in looking at self-predictions, we must study various forms that our questions to the students might take. In other words, what do we ask students and how do we ask them so that we maximize predictive efficiency?

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Table 1

Prediction of Graduation Field of Study from Interest, Achievement, Self-Expressed Choice Data--Male Samples

| Field of Study | Interest Data | | Achievement Data | | | Self-Expressed Choice Data: Intended Div. of Regist. | | | Self-Expressed Choice Data: 1st Choice Major Field | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | f | %Hits | f | %Hits | N | f | %Hits | N | f | %Hits | N |
| Engineering | 29 | 58.0 | 31 | 62.0 | 50 | 91 | 92.8 | 98 | 78 | 86.7 | 90 |
| Business | 29 | 59.1 | 15 | 30.6 | 49 | 41 | 46.0 | 89 | 35 | 47.3 | 74 |
| Pharmacy | 2 | 11.7 | 0 | 0.0 | 17 | 19 | 51.3 | 37 | 17 | 51.5 | 33 |
| Letters & Science | 17 | 35.4 | 24 | 50.0 | 48 | 16 | 19.7 | 81 | 23 | 31.5 | 73 |
| Secondary Education | 29 | 58.0 | 6 | 12.0 | 50 | 53 | 57.6 | 92 | 24 | 30.0 | 80 |
| Total | | | | | 214 | | | 397 | | | 350 |

Note--Interest and achievement data predictions are for the cross-validation samples. Self-expressed choice data predictions are for the combined criterion and cross-validation samples, excluding "undecided" and "no response" answers to the questions, because such answers were not predictions

Table 2

Prediction of Graduation Field of Study from Interest, Achievement Self-Expressed Choice Data--Female Samples

| Field of Study | Interest Data | | Achievement Data | | | Self-Expressed Choice Data: Intended Div. of Regist. | | | Self-Expressed Choice Data: 1st Choice Major Field | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | f | %Hits | f | %Hits | N | f | %Hits | N | f | %Hits | N |
| Nursing | 25 | 67.5 | 13 | 35.1 | 37 | 62 | 77.5 | 80 | 59 | 81.9 | 72 |
| Elementary Education | 30 | 60.0 | 20 | 40.0 | 50 | 69 | 79.3 | 87 | 52 | 64.2 | 81 |
| Letters & Science | 17 | 44.7 | 15 | 39.4 | 38 | 36 | 50.7 | 71 | 38 | 73.1 | 52 |
| Total | | | 125 | | | 238 | | | 205 | | |

Note--Interest and achievement data predictions are for the cross-validation samples. Self-expresses choice data predictions are for the combined criterion and cross-validation samples, excluding "undecided" and "no response" answers to the questions, because such answers were not predictions.

Table 3

Summary of Correct Predictions Across Fields

| Type of Data | % Correct Predictions | |
|---|---|---|
| | Men | Women |
| Occupational Interest | 50.2 | 58.0 |
| Academic Achievement | 34.3 | 38.8 |
| Expressed Field - Intended Division of Registration | 55.4 | 70.2 |
| Expressed Field - 1st Choice of Major Subject | 50.6 | 72.7 |